Claims

[c1] 1. A method to discharge a capacitor in an automotive electric drive system of an electric vehicle, wherein the electric drive system includes a DC electric power source coupled by contactors to the capacitor for providing power to an electric motor coupled to a pair of wheels to drive the vehicle, the method comprising:
determining a disconnect of the contactors; and
discharging the capacitor in response to the disconnect by controllably transferring energy from the capacitor to the electric motor without driving the wheels.

[c2] 2. The method of claim 1 wherein the electric drive system includes an electric motor controller coupled between the capacitor and the electric motor to controllably transfer energy from the capacitor to the electric motor by controlling current drawn from the capacitor and voltage provided to the electric motor.

[c3] 3. The method of claim 2 wherein discharging the capacitor comprises controlling flux and torque produced by the electric motor to produce positive power flow from the capacitor to the electric motor.

[c4] 4. The method of claim 2 wherein discharging the capacitor comprises controlling by a software program the electric motor controller to control the current drawn from the capacitor and the voltage provided to the electric motor by controlling flux and torque produced by the electric motor.

[c5] 5. The method of claim 4 wherein discharging the capacitor further comprises the software program calculating a quadrature-axis current value and a direct-axis current value to control the voltage provided to the electric motor, wherein the voltage provided to the electric motor controls torque and flux produced by the electric motor.

[c6] 6. The method of claim 5 wherein discharging the capacitor comprises calculating the quadrature-axis current value and the direct-axis current value such that the quadrature-axis current value is sufficiently small to produce insufficient torque to drive the wheels.

[c7] 7. The method of claim 5 wherein discharging the capacitor comprises calculating the quadrature-axis current value and the direct-axis current value such that the quadrature-axis current value is zero and no torque is produced by the electric motor for any direct-axis current value.

[c8] 8. The method of claim 8 wherein calculating the quadrature-axis current value and the direct-axis current value comprises calculating values to produce positive power flow from the capacitor to the electric motor which is insufficient torque for driving the wheels.

[c9] 9. An automotive electric distribution system for use in an electric vehicle, the system comprising:
a DC power source to provide DC energy;
a capacitor coupled to the power source;
a pair of contactors connected between the DC power source and the capacitor to electrically separate the DC power source from the capacitor if the contactors are open;
an AC electric motor coupled to the power source and coupled to a pair of wheels to drive the vehicle;
an electric motor controller coupled between the capacitor and the electric motor to control voltage provided to the electric motor; and
a software program to discharge the capacitor by controlling the electric motor controller such that energy can be controllably transferred from the capacitor to the electric motor by controlling current drawn from the capacitor and voltage provided to the electric motor.

[c10] 10. The system of claim 9 wherein the software program

controls discharging of the capacitor by controlling current drawn from the capacitor and voltage provided to the electric motor.

[c11] 11. The system of claim 9 wherein the software program controls discharging of the capacitor by controlling lux and torque produced by the electric motor.

[c12] 12. The system of claim 11 wherein the software program controls discharging of the capacitor by controlling flux and torque produced by the electric motor to produce positive power flow from the capacitor to the electric motor.

[c13] 13. The system of claim 9 wherein the software program controls discharging of the capacitor by calculating a quadrature-axis current value and a direct-axis current value to control the voltage provided to the electric motor, wherein the voltage provided to the electric motor controls torque and flux produced by the electric motor.

[c14] 14. The system of claim 13 wherein the quadrature-axis and direct axis current values are calculated to produce positive power flow from the capacitor to the electric motor.

[c15] 15. A method to discharge a capacitor in an electric vehicle electric drive system, wherein the electric drive sys-

tem includes a DC electric power source coupled by contactors to the capacitor for providing power to an electric motor, the method comprising:
determining a disconnect of the contactors; and
controllably discharging the capacitor in response to the disconnect by controlling current drawn from the capacitor and voltage provided to the electric motor such that stored capacitor energy is controllably transferred from the capacitor to the electric motor.

[c16] 16. The method of claim 15 further comprising controlling the current flow from the capacitor such that positive power flow is produced from the capacitor to the electric motor.

[c17] 17. The method of claim 16 further comprising providing a software program to monitor a load on the electric motor and to control the positive power flow based on the load.

[c18] 18. A method for discharging a capacitive element coupled across a power source of an electric drive system, the method comprising:
controllably discharging the capacitive element by controlling current drawn from the capacitive element and transferred to an electric motor.

[c19] 19. The method of claim 18 wherein discharging the capacitive element comprises controlling flux and torque produced by the electric motor to produce positive power flow from the capacitive element to the electric motor.

[c20] 20. The method of claim 18 wherein discharging the capacitive element comprises controlling by a software program calculating a quadrature-axis current value and a direct-axis current value to control the voltage provided to the electric motor, wherein the voltage provided to the electric motor controls torque and flux produced by the electric motor and the current drawn from the capacitive element.